In the Specification:

Please insert the following paragraph at page 1, line 2, before the first paragraph;

Cross Reference to Related Patent Applications

A1 This patent application claims the benefit of U.S. Provisional Patent Application No. 60/118,985, filed on February 8, 1999.

Please replace the paragraph starting at page 1, line 8, with the following:

A2 Large ducted fans are commonly used in the cooling towers of electric utilities to remove heat from the cooling water of heat exchangers. These fans are made up of four to twelve blades which range from 5 to 20 feet (1.5 to 6.1 meters) in length. A standard twelve foot (3.7 meter) blade employing the NACA 63_2 - 615 airfoil from root to tip has been the most commonly used blade in cooling tower applications. This airfoil has a chord thickness of 15%, and it is designed for an operating lift coefficient of 0.6 with a low-drag range that extends from a lift coefficient of 0.4 to 0.8. It was initially designed in the early 1940's for use in general aviation and has been in use over the past 50 years. As a result, certain prior art design objectives have evolved over the course of these years.

Please replace the paragraph starting at page 1, line 30, with the following:

A3. The tip airfoil should be thin enough to provide low drag, but should also provide a maximum lift-to-drag ratio (l/d) at high values of lift coefficient to minimize blade solidity. In the hub region, blade-element performance predictions have indicated the presence of low blade angles of attack. As a result, the root airfoil should produce a high lift coefficient at zero angle of attack. Designing new airfoils, having a minimal sensitivity to roughness, is therefore desirable should the blade operate in a stalled condition. Stalled conditions are usually caused either by an unsteady inflow or the low air density which is encountered when operating the fans at high temperatures.

Please replace the paragraph starting at page 3, line 23, with the following **three** paragraphs:

Figure 1 is a profile of a prior art NACA 63_2-615 airfoil;

Figure 2 is a profile of a tip airfoil according to the present invention; and

Figure 3 is a profile of a root airfoil according to the present invention.

Please replace the paragraph starting at page 3, line 28, with the following:

An analysis method of Borst was used to assess the performance of the prior art NACA 63_2-615 airfoil and to identify the aerodynamic improvements of the invention herein; see Borst, Henry V., "A New Blade Element Method for Calculating the Performance of High and Intermediate Solidity Axial Flow Fans," NASA-CR-3063, 1979. The Borst analysis method uses a rigid-wake model in conjunction with a cascade theory to provide a blade-element analysis method able to use two-dimensional airfoil data.

$$\sigma c_l = 2\cos(\beta_1 - \alpha_i)[\tan \beta_1 - \tan(\beta_1 - 2\,\alpha_i)]\ K(x)/K(x)_{\text{infinity}} \qquad \text{(Eq. 1)}$$

In Eq. 1, σ is the local blade solidity; c_l is the section lift coefficient; β_1 is the inflow angle; α_i is the induced angle of attack that results from wake-induced inplane swirl; x is the non-dimensional radius; and K(x) is Theodorson's circulation function. K(x) is a function of the number of blades, the wake advance ratio, and the radial position of the blade. $K(x)_{\text{infinity}}$ is Theodorson's circulation function for a fan having an infinite number of blades. The values of K(x) can be found using graphs from Borst, which were created using the rigid, helical-wake model of Gray and Wright; see Gray, Robin B., and Terry Wright, "Determination of the Design Parameters for Optimum Heavily Loaded Ducted Fans," AIAA/AHS VTOL Research, Design, and Operations Meeting, February 17-19, 1969, AIAA Paper No. 69-222; Gray, Robin B., and Terry Wright, "A Vortex Wake Model for Optimum Heavily Loaded Ducted Fans," Journal of Aircraft, Vol. 7, No. 2, March-April 1970. The other main equation (Eq. 2) relates the flow angle and the induced angle to an equivalent two-dimensional angle of attack.

$$\alpha = \beta_1 - \Phi - \alpha_i \quad \text{(Eq. 2)}$$

In Eq. 2, Φ is the angle between the chord line and the plane of rotation. For a given blade, the equivalent two-dimensional angle of attack can be calculated knowing the induced angle of attack.

Please replace the paragraph starting at page 5, line 18, with the following:

Figure 2 is a profile of the tip airfoil (20), according to the present invention, relative to the prior art NACA 63_2-615 airfoil (10) shown in Figure 1. The upper surface of the tip airfoil (20) is shown at (22) and the lower surface at (23). The leading edge of the tip airfoil is at (24) and the trailing edge is at (25). The chord is shown at line (21). The tip airfoil has a thickness of 10% chord.

Please replace the paragraph starting at page 5, line 23, with the following:

The specific geometric tailoring of the tip airfoil (20) of Figure 2 is given in the form of the following table of coordinates. The x/c values are dimensionless locations along the blade chord line (21). They are given for both the upper (22) and lower (23) surfaces. The y/c values are the dimensionless heights from the chord line (21) to points either on the upper or lower surface.

Please replace the paragraph starting at page 7, line 20, with the following:

Figure 3 is a profile of the root airfoil (30), according to the present invention, relative to the prior art NACA 63_2-615 airfoil (10) shown in Figure 1. The upper surface of the root airfoil is shown at (32) and the lower surface at (33). The leading edge of the root airfoil is at (34) and the trailing edge is at (35). The root airfoil has a thickness of 14% chord.

Please replace the paragraph starting at page 7, line 24, with the following:

The specific geometric tailoring of the root airfoil (30) of Figure 3 is given in the form of the following table of coordinates. The x/c values are dimensionless locations along the blade chord line (31). They are given for both the upper (32) and lower (33) surfaces. The y/c values are the dimensionless heights from the chord line (31) to points either on the upper or lower surface.

Please replace the paragraph starting at page 9, line 34, with the following:

Fan performance was calculated with the tip and the root airfoils using the baseline blade taper and twist geometry for the design thrust of 2000 LB (8900 newton). The airfoils of the invention can be used for fans having individual blades ranging from 3 to 10 meters in length. For the baseline blade the 2000 LB (8900 newton) thrust is achieved at a geometric pitch angle of 2° versus 0° for the new airfoils. For these geometric blade-pitch angles, the new airfoils result in a performance gain of 1.5% for an eight-bladed 28-foot (8.534-meter) diameter fan. This gain does not take into account the gain that would be attributable to the airfoil's improved insensitivity to roughness where some measure of improvement is expected. It should be noted that the geometric pitch angle is with respect to the airfoil chord line which differs from a field pitch angle setting that is normally with respect to the lower surface of the airfoil. For the NACA 63_2-615 airfoil the field pitch setting is 4° greater than the geometric pitch angle.